

Claims

1. An apparatus for continuously singling loose sheet material, having a singling unit (5) for singling a stack (1) of loose sheet material and a feeding device (2, 3) for bringing a stack (1) of loose sheet material to be singled from a deposit position to a position in which the uppermost sheet of the stack can be grasped by the singling unit (5),  
  
characterized in that  
  
the feeding device (2, 3) has a first multiaxially movable feeding element (2) and a second uniaxially movable feeding element (3) .
2. The apparatus according to claim 1, characterized in that the first feeding element (2) brings, by a uniaxial feeding motion, a stack of loose sheet material to be singled from the deposit position to the position in which the uppermost sheet of the stack can be grasped by the singling unit (5) and, by being drawn out of the feeding path (8), unites the stack (1) to be singled with a stack (4) to be fed located below the first feeding element (2).
3. The apparatus according to claim 1 or 2, characterized in that the second feeding element (3) brings, by a uniaxial motion on the feeding path (8), the stack (4) to be fed from the deposit position to a position in which the uppermost sheet of the stack (4) to be fed comes to lie below the first feeding element (2).
4. The apparatus according to at least one of the previous claims, characterized in that the first feeding element (2) assumes the position of the second feeding element (3) by traversing a loop-shaped motion path (10) and being inserted into the feeding path (8), and the second feeding element (3) returns to the deposit position for receiving a stack (4) to be fed on the feeding path (8).
5. The apparatus according to at least one of the previous claims, characterized in that the second feeding element (3) has depressions, and the first feeding element (2) is formed complementary so that it can engage the depressions at least partly.

6. The apparatus according to at least one of the previous claims, characterized in that the first feeding element (2) is moved into the feeding path (8) below the stack (1) of loose sheet material carried by the second feeding element (3).
7. The apparatus according to at least one of the previous claims, characterized in that the first feeding element (2) has a deposit surface (11, 14) which can be rotated and/or opened and/or horizontally and/or vertically shifted with respect to other components of the first feeding element (2).
8. The apparatus according to at least one of the previous claims, characterized in that the first feeding element (2) has a deposit surface (14) with holes (15), and a plurality of opposing elements (17) which can reach through the holes (15).
9. The apparatus according to at least one of the previous claims, characterized in that the deposit surface (14) with holes (15) and the opposing elements (17) can be shifted relative to each other to be able to hold a stack (4) of sheet material to be singled spaced from the deposit surface, and/or the opposing elements (17) can engage the holes of the first feeding element (2) to such an extent as to provide a substantially closed deposit surface (14) for subsequent application of a loose stack of sheet material to be singled.
10. The apparatus according to at least one of the previous claims, characterized in that the apparatus has one or more sensors which detect the presence of a stack (4) fed by the second feeding element (3) below the first feeding element (2), and/or detect the last sheet of a stack to be singled, and/or detect a stack (4) to be fed located in the deposit position.
11. The apparatus according to at least one of the previous claims, characterized in that the first and second feeding elements (2, 3) are driven by stationary motors.
12. The apparatus according to at least one of the previous claims, characterized in that stacks of sheets to be singled can be fed to the feeding device alternatively automatically or manually.

13. A method for continuously singling loose sheet material, characterized in that by means of a feeding device (2, 3) having a first multiaxially movable feeding element (2) and a second uniaxially movable feeding element (3), a stack (1) of loose sheet material to be singled is brought from a deposit position to a position from which the uppermost sheet of the stack is grasped and singled by a singling unit (5).
14. The method according to claim 13, characterized by the following steps:
  - (a) feeding a stack (1) of loose sheet material to be singled located on the first feeding element (2) to the singling unit (5), by a feeding motion of the first feeding element (2) on a feeding path (8), from a deposit position to a position in which the uppermost sheet of the stack (1) can be grasped by the singling unit (5),
  - (b) singling the fed stack (1) sheet by sheet by the singling unit (5), the stack (1) being fed by the feeding element such that the particular uppermost sheet of the stack (1) can be grasped by the singling unit (5),
  - (c) feeding a stack (4) of loose sheet material to be fed located on the second feeding element (3) to singling, by moving the second feeding element (3), from the deposit position to a position in which the uppermost sheet of the stack (4) to be fed is located below the first feeding element (2), and
  - (d) uniting the stack (1) to be singled and the fed stack (4) by drawing the first feeding element (2) out of the feeding path (8).
15. The method according to claim 14, characterized in that, after the step of uniting the stacks, the following further steps are carried out:
  - (e) taking over the united stack (7) of loose sheet material by the first feeding element (2), whereby the first feeding element (2) assumes the position of the second feeding element (3) by traversing a loop-shaped motion path (10) and being inserted into the feeding path (8), and
  - (f) returning the second feeding element (3) to the deposit position,
  - (g) depositing a further stack (4) of loose sheet material on the returned second feeding element (3) and then feeding said further stack (4).

16. The method according to claim 15, characterized in that the traversing of the loop-shaped motion path (10) of the first feeding element (2) consists of the following steps:
  - (h) perpendicular motion leading away from the feeding path (8),
  - (i) motion parallel to the feeding path (8) in the direction of the deposit position to a position adjacent the second feeding element (3), and
  - (k) perpendicular motion leading to the feeding path (8).
17. The method according to at least one of claims 11 to 16, characterized in that the first feeding element (2) engages depressions of the second feeding element (3) when being inserted into the feeding path (8).
18. The method according to at least one of claims 11 to 17, characterized in that the first feeding element (2) is inserted into the feeding path (8) below the stack (1) of loose sheet material carried by the second feeding element (3).
19. The method according to at least one of claims 11 to 18, characterized in that a deposit surface (11, 14) of the first feeding element (2) is rotated and/or opened and/or horizontally and/or vertically shifted with respect to other components of the first feeding element (2).
20. The method according to at least one of claims 11 to 19, characterized in that a plurality of opposing elements (17) of the first feeding element (2) reach through holes (15) of a deposit surface (14) of the first feeding element (2) to hold a stack (4) of sheet material to be singled.
21. The method according to at least one of claims 11 to 20, characterized in that the opposing elements (17) engage the holes of the first feeding element (2) to such an extent as to provide a substantially closed deposit surface (14) for subsequent application of a loose stack of sheet material to be singled.
22. The method according to at least one of claims 11 to 21, characterized in that the presence of a fed stack (4) below the stack (1) to be singled is recognized automatically, and thereupon the uniting of the two stacks is initiated.

23. The method according to at least one of claims 10 to 22, characterized in that a stack (4) of loose sheet material to be fed located in the deposit position is recognized automatically, and/or the last sheet to be singled in a stack (1) to be singled is recognized automatically.
24. Use of the apparatus according to any of claims 1 to 12 for continuous sheet-by-sheet singling of stacks of loose bank notes in a bank note processing apparatus in which the singled bank notes are automatically checked and deposited.